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Commissioner for Patents

Washington, D.C.

SIR:

1. My name is Arnold Edward Rees. I reside at 9 Melmerby Close, Whitebridge Park, Gosforth, Newcastle Upon Tyne, NE3 5JA, United Kingdom. I am a business product innovation consultant and have been providing related client services since 2000. I have 25 years of experience in design, manufacture and quality assurance of infant accessories, having spent 20 years with Jackel International Limited ("Jackel" herein). At Jackel, I held positions in technical and factory management, and spent 14 years as a Board Director responsible for product design, technical development and quality assurance.

(A) Background

2. Before the revelation that energy loss due to stretching of the diaphragm was detrimental to the suction of manual breast pumps, Jackel developed and sold the PUR breast pump (Jackel internal development No. 782). The PUR pump was a thumb-operated piston pump which utilised a piston to generate suction for extracting breast milk and had a cup-shaped sliding seal attached to the end of the piston. In the late 1990s, the PUR pump was re-branded as the MAWS breast pump.

3. The PUR/MAWS pump was developed after Ilan Samson approached Jackel with a thumb-operated piston pump design. I refer to Exhibit AR1 which is a copy of granted European patent EP0739220 which describes Ilan Samson's thumb-operated design. Jackel have a licence to this patent.

4. I refer to Exhibits AR2 and AR3 which are extracts from Jackel's 1998-99 and 2002-03 product brochures respectively. These brochures illustrate the PUR/MAWS pump sold by Jackel. The 1998-99 brochure shows an early version of the PUR/MAWS pump with Jackel product code 437096. The 2002-03 brochure shows a cosmetically updated version of the PUR/MAWS pump with Jackel product code 85675053.

5. In the late 1990s, Jackel were approached by Boots, a UK retail chain, who wanted to sell a version of the PUR/MAWS pump under their own "Boots" label. Jackel agreed and started to sell a BOOTS pump. The BOOTS pump had the same design as the PUR/MAWS pump, but was branded using the "Boots" label.

6. Up to 1998, Jackel's total expenditure on research and development in achieving a reliable and manufacturable design for the PUR/MAWS and BOOTS pumps was approximately £70,000 (about $140,000).

(B) Challenges Facing the Manual Breast Pump Industry in the late 1990s and early 2000s

7. In the late 1990s and early 2000s, the manual breast pumps of all major brands (e.g. Avent, Evenflo, Medela, Ameda) utilised either a piston or a stretchable diaphragm in order to generate suction.

8. I refer to Exhibit AR4 which is an internal Design Brief for future development of the PUR/MAWS pump from 1998. Although this document describes the design aims for the PUR/MAWS pump, it is also demonstrative of the challenges within the industry as a whole in the late 1990s and early 2000s.

9. As exemplified by Exhibit AR4, the main design challenges facing the manual breast pump industry in the late 1990s and early 2000s were seen as the need to minimise the number of parts that must be dismantled for ease of cleaning, sterilising and reassembling the breast pump, whilst optimising appearance, function, comfort and performance.

10. As far as I am aware, the problem of energy loss associated with stretchable diaphragms in breast pumps was not known in the industry outside of Jackel in the late 1990s or early 2000s. In particular, this problem was not known in the industry at the time of filing of patent application U.S.S.N. 10/518,900 (19 June 2003).

(C) Development of the FREEDOM pump

11. Well prior to 2000, a new pump design was developed by Ilan Samson which utilised a non-stretch collapsible bellows diaphragm instead of a thumb-operated piston and which corresponds to that disclosed in the instant application U.S.S.N. 10/518,900.

12. In creating the new pump design, Ilan Samson had identified a previously unobserved problem which was that energy loss due to stretching of diaphragms in existing breast pumps was resulting in a loss of suction. It was thought that the non-stretch collapsible bellows diaphragm of the new pump design would solve this problem by eliminating friction and reducing the propensity of the diaphragm to balloon or stretch under load, due to convolutions in the diaphragm. Therefore, it was thought that the new pump design would have improved efficiency compared to manual breast pumps that had a stretchable diaphragm.

13. Although, early on, the improved efficiency of the new pump design was only theoretical, Jackel agreed to start working with Ilan Samson in developing the new pump design into a manufacturable product.

14. To start with, development of the new pump design was informal and focussed on evaluating how to manufacture the non-stretch diaphragm and developing machinery capable of making it. Some initial investigations were also made into whether the theoretical improved efficiency of the non-stretch diaphragm could be achieved in practice. However, because Jackel had invested considerable amounts of money in getting the PUR/MAWS pump to market and wanted a return on this investment, initial progress on developing the new pump design was slow.

15. By 2002, the initial investigations into the new pump design were looking very promising. Therefore, Jackel began formal development of the new pump design (Jackel internal development No. 958) on 9 January 2002. The new pump was to be called the FREEDOM pump.

16. Also in 2002, Ilan Samson filed a UK patent application for the new pump design. The UK application was filed on 24 June 2002 (UK application number GB0214525.8, from which the instant patent application U.S.S.N. 10/518,900 claims priority).

17. Once the FREEDOM pump had been developed, Jackel launched the FREEDOM pump in 2005. As with the pump described in Ilan Samson's patent application, the FREEDOM pump was a manual breast pump which utilised a non-stretch collapsible bellows diaphragm, instead of the thumb-operated piston of the PUR/MAWS and BOOTS pumps.

18. The improved efficiency of the FREEDOM pump, due to its non-stretch diaphragm, represented a breakthrough in manual breast pump design. In a typical pumping session (e.g. 20 strokes per minute for 20 minutes), a user of a manual breast pump has to expend a significant amount of energy. Because of its improved efficiency, a user of the FREEDOM pump needs to use much less effort in order to produce a desired volume of milk. As a consequence, a user of the FREEDOM pump finds the process of producing milk far less tiring.

19. As Ilan Samson pointed out during the development of the FREEDOM pump, anyone who has used a manual breast pump under load for only 50 cycles will understand the importance of efficiency (meaning that you would soon feel the effect of pumping in your arm muscles). To my mind, any new pump design that delivers a significant reduction in user effort in delivering the same volume of milk is highly desirable and this invention does exactly that.

20. The total expenditure by Jackel in the development of the FREEDOM pump was in the region of £400,000 ($800,000), which was considerably higher than the £70,000

($140,000) expenditure on development of the PUR/MAWS and BOOTS pumps. Jackel considered the advantages provided by the FREEDOM pump design in overcoming the previously unrecognised problem (i.e., unrecognized by Jackel and the industry) of energy loss due to diaphragm stretching warranted this very significant expenditure.

(D) Experiment showing improved efficiency of non-stretch diaphragms

21. Throughout the development of the FREEDOM pump, which, in one embodiment, comprises a collapsible "bellows" diaphragm as described above, Jackel were made aware of the benefits of an alternate embodiment of the new pump design which utilised a non-stretch material comprising, for example, an elastic material in-moulded with a fabric mesh. This alternative embodiment is described in the instant patent application U.S.S.N. 10/518,900 with reference to Fig. 4.

22. In 2005, when the FREEDOM pump design had been finalised, Jackel conducted an experiment to test the effect of this alternate embodiment, in particular, to see what impact the use of a non-stretch material would have on pumping efficiency.

23. The experiment was conducted using the Avent ISIS pump that was being sold at that time, to confirm the theoretical energy saving of replacing a stretchable diaphragm (as used in the Avent ISIS pump) with a non-stretch diaphragm in a manual breast pump.

24. The design of the Avent ISIS pump is described in detail in the U.S. Patent No. 5,743,850 to Williams (see especially Figs. 7 and 8 and the accompanying description). The Avent ISIS pump has a diaphragm which stretches during use. The diaphragm of the Avent ISIS pump corresponds to part 51 in Fig. 8 of the Williams patent. I am informed that the Williams patent is the primary referenced relied on by the U.S. Examiner.

25. As part of the experiment, Jackel fabricated a non-stretch test diaphragm which had the same shape and dimensions as the Avent ISIS diaphragm, but had a fabric mesh inlaid into the moulded elastic material to prevent the diaphragm from stretching. I refer to Exhibit AR5 which is a technical drawing of Jackel's test diaphragm dated 26 December

2005. The technical drawing shows an inlaid fabric cloth which prevents the test diaphragm from stretching.

26. I also refer to Exhibit AR6 which is a comparative photograph of the Avent ISIS diaphragm and Jackel's test diaphragm. Jackel's (non-stretch) test diaphragm is on the left, with the fabric reinforcement visible on its far wall where it has creased. The (stretchable) Avent ISIS diaphragm is on the right.

27. Comparing the work done and the negative pressure generated by the standard Avent ISIS pump against the same pump using the Jackel test diaphragm, showed that the non-stretch diaphragm made the pump 40% more efficient. In other words, generating 400 millibars of negative pressure was achieved by doing 40% less work with Jackel's test diaphragm (compared with the diaphragm of the Avent ISIS pump). Consequently, less effort would be required by a user to produce the same volume of milk when using the Jackel test diaphragm.

28. I refer to Exhibit AR7 which is a copy of theoretical calculations showing that the energy wasted in stretching the diaphragm of conventional breast pumps (having a stretchable diaphragm) is of the order of 18%. The results of Jackel's 2005 experiment confirm this theoretical calculation, by showing that using a non-stretch diaphragm does, in practice, lead to a significant increase in efficiency.

29. The calculations shown in Exhibit AR7 relate solely to energy wasted in the ring of material at the outer edge of the stretchable diaphragm (labelled "annular area 'A' "). However, other parts of the stretchable diaphragm shown in Exhibit AR7 (e.g. the vertical walls or the horizontal section pulled by the plastic piston) would also benefit from being non-stretch. Consequently, the actual energy loss associated with this stretchable diaphragm should be even higher than 18%. This provides an explanation for the difference between the theoretical efficiency gain (18%) and the experimental efficiency gain (40%) of using a non-stretch diaphragm.

(E) Commercial Impact of the FREEDOM pump

30. Following launch, the FREEDOM pump was very well received by customers, being stocked by most major retailers and supplied to National Account customers as own-branded pumps. The main focus of customer presentations by Jackel was the improved efficiency due to the new diaphragm, along with the reduction of the number of parts and the soft breast shell.

31. The FREEDOM pump was bought in far higher numbers than the PUR/MAWS pump. Indeed, the PUR/MAWS breast pump had UK sales that never exceeded 10,000 units per year, whereas since its launch in 2005, the FREEDOM pump has seen a significant growth in sales in the UK from 67,000 in 2006 to 100,000 in 2007. The improved efficiency due to the non-stretch diaphragm of the FREEDOM pump, and therefore the reduction in effort required from a user to generate a desired volume of milk, has been a key contributor to the commercial success of the FREEDOM pump.

(F) Conclusion

32. The development of a new manual breast pump incorporating a non-stretch diaphragm by Ilan Samson provided a solution to the problem of energy loss due to stretching reducing the suction of existing manual breast pumps. This problem was not known in the manual breast pump industry at the time of filing of U.S.S.N. 10/518,900 (19 June 2003).

33. The improved efficiency achieved by the non-stretch diaphragm of the FREEDOM pump has been a key contributor to its commercial success. In particular, the improved efficiency of the FREEDOM pump has meant that its users find that the process of producing milk is made far less tiring.

(G) Index of Exhibits

34. The Exhibits referred to in this declaration are summarised in the table below.

Exhibit AR1	A copy of granted European patent EP0739220 B
Exhibit AR2	An extract from Jackel's 1998-99 product brochure
Exhibit AR3	An extract from Jackel's 2002-03 product brochure
Exhibit AR4	A design briefing for future development of the MAWS pump by Elizabeth Walden, dated 11 September 1998
Exhibit AR5	Technical drawing of Jackel's test diaphragm dated 26 December 2005
Exhibit AR6	A comparative photograph of the Avent ISIS diaphragm and Jackel's test diaphragm
Exhibit AR7	Theoretical calculation of wasted energy in stretchable diaphragms

(H) Penalty Paragraph

35. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 USC 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Arnold Edward Rees

15 · 2 · 2008

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(54) BREAST PUMP

BRUSTPUMPE

TIRE-LAIT

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EP 0 739 220 B1

Description

Background and Summary of the Invention:

[0001] The instant invention relates a maternity apparatus and more particularly to an effective, self-operated, manual breast pump for a mother of a young infant.

[0002] It is well recognized that mother's milk is preferable to other foods, such as cow's milk or various feeding formulas for feeding infants. However, it is also well recognized that it is often not practical for mothers to breast feed their infant children over prolonged periods of time. As a result, various types of pumping devices have been heretofore developed for extracting mother's milk from the breasts of mothers of young children.

[0003] A number of different types of devices, including both electrical and manual breast pumps, have been heretofore available for extracting mother's milk from the breasts of women. In this regard, however, electrically operated breast pumps which operate on standard house current have generally been found to be impractical as being costly and awkward to transport. Battery-powered electrical pumps have also been found to be costly, and they have generally been found to be less effective than other types of breast pumps. As a result, even though many of the heretofore available hand operated pumps have been found to be awkward and tedious to use, they have generally been found to be less costly and more practical than electrically operated breast pumps.

[0004] Manually operated breast pumps representing closest prior art to the subject invention of which the applicant is aware are disclosed in the US Patent to Halstead No. 790,051; Howell No. 897,289; Del Castillo No. 1,484,874; Brown No. 1,509,226; Saunders No. 2,419,795; Loyd No. 3,782,385; Adams No. 4,263,912; Adams No. 4,323,067; Diamond No. 4,311,141; Buechel et al No. 4,400,168; Kirchner No. 4,583,970; Hobbs No. 4,813,932; Yuan et al No. 4,892,517; Corby No. 4,983,634 and Riedweg et al No. 5,009,638 and the British patents Nos. 762,701; 2,082,920, 2,127,293. However, while these references disclose a wide variety of different manually operated devices, they fail to provide a simple breast pump which is practical, relatively inexpensive to the manufacture and easy to operate.

[0005] According to the present invention there is provided a breast pump comprising a pump body having an interior and including a breast engaging portion facing in a first direction and a base portion; a breast milk receiving container on said base portion; a one way valve between said base portion and said container for alternatively maintaining a vacuum in said pump body or allowing breast milk to pass into said container; a piston and cylinder assembly on said pump body, said piston and cylinder assembly including a cylinder communicating with the interior of said pump body, a piston in said cylinder and sealing means between said piston and said cylinder, said piston being moveable in said cylinder in a second direction which is substantially opposite to said first direction for applying vacuum to the interior of said pump body, said piston and cylinder assembly including a thumb receiving element which is directly connected to said piston, said thumb receiving element being moveable in said second direction for directly moving said piston in said second direction in said cylinder; and a handle on said pump body adapted to receive a hand of a user, the thumb on said hand being received in said thumb receiving element whereby the piston is movable in the second direction by said thumb.

[0006] Preferably said handle is normally spaced from said thumb receiving element in said second direction.

[0007] Conveniently, the pump further comprises biasing means biasing said piston in substantially said first direction in said cylinder.

[0008] Preferably, said piston travels in said second direction from a first position in said cylinder to a second position therein for applying vacuum to said pump body interior, said biasing means biasing said piston with a substantially constant biasing force during movement of said piston between said first and second positions.

[0009] The biasing means may comprise a resiliently bendable elongated band, said band moving from a first reduced partially bent position thereof to a second increased partially bent position thereof during movement of said piston from the first position thereof to the second position thereof.

[0010] Preferably the piston is normally spaced from the cylinder and is guided in its travel therein in said second direction solely by said seal means and said thumb in said thumb receiving element.

[0011] The instant invention provides a highly effective self-operated breast pump which is effective and easy to operate for extracting mother's milk from the breasts of a woman, and can be constructed at a relatively low cost, and which is adapted for easy and effective single-handed operation.

[0012] It has been found that, because the breast pump of the invention includes a piston and cylinder assembly comprising a piston which is directly moveable in a direction away from an operator with a thumb on a hand of the operator by drawing the thumb toward a handle element, the piston and cylinder assembly can be simply and easily operated for extracting mother's milk from a breast of the operator. In this regard, because the device is operated by merely drawing the thumb receiving element towards the handle element by moving a thumb on a hand of the operator toward the fingers on the same hand, the device can be comfortably operated for reciprocating the piston in the cylinder to extract mother's milk from a breast of the operator. Further, because the breast pump can include a resilient spring element which is operative for biasing the piston in the first direction with a substantially constant biasing face, the amount of resistance to movement of the piston in the second direction by an operator of the device can be maintained at a minimal level to enable the device to

be even more easily manipulated by the operator. Still further, because the handle element can be positioned in substantially perpendicular relation to the direction in which the breast engaging portion faces, the handle element can be more easily and comfortably grasped by an operator during use of the device.

Description of the Drawings:

[0013] In the drawings which illustrate the best mode presently contemplated for carrying out the present invention:

Fig. 1 is a perspective view of the breast pump of the instant invention with the piston in the first position thereof;
Fig. 2 is a similar perspective view with the piston in the second position thereof;
Fig. 3 is an exploded perspective view of the breast pump;
Fig. 4 is a sectional view taken along line 4-4 in Fig. 1; and
Fig. 5 is a sectional view taken along line 5-5 in Fig. 2.

Description of the Invention:

[0014] Referring now to the drawings, the breast pump of the instant invention is illustrated and generally indicated at 10 in Figs. 1 through 5. The breast pump 10 comprises a pump body generally indicated at 12, a breast milk receiving container 14, a valve assembly generally indicated at 16 between the pump body 12 and the container 14, a piston and cylinder assembly generally indicated at 18 on the pump body 12, a handle assembly generally indicated at 20 and a biasing element 22. The breast pump 10 is adapted to be held against a breast of an operator utilizing a hand of the operator while the same hand is operated for manipulating the piston and cylinder assembly 18 to apply a vacuum to the interior of the pump body 12. Accordingly, the pump 10 can be utilized for drawing mother's milk into the interior of the pump body 12 so that the mother's milk can be passed downwardly through the valve assembly 16 and into the container 14 when the vacuum is released in the interior of the pump body 12.

[0015] The pump body 12 is preferably integrally molded from a suitable plastic material, and it includes a conical or funnel-shaped breast engaging portion 24, a central tubular portion 26, which extends from the breast engaging portion 24, and a base portion 28 which extends downwardly from the tubular portion 26. The breast engaging portion 24 is adapted to be received in engagement with a breast of an operator so that the nipple on the breast is directed into the tubular portion 26. The base portion 28 extends downwardly from the tubular portion 26, and it merges into a threaded cap portion 30 around an opening 31. The cap portion 30 is adapted to be received in threaded engagement on the container 14, and it has a vent opening 32 therein for venting air from the container 14 as mother's milk is accumulated therein.

[0016] The container 14 is preferably integrally molded from a suitable transparent plastic material, and it includes a threaded upper neck portion 34 which is adapted to be received in threaded engagement in the cap portion 30.

[0017] The valve assembly 16 is operative for maintaining a vacuum in the pump body portion 12 as the piston and cylinder assembly 18 is operated to produce a vacuum therein, but it is nevertheless adapted to permit mother's milk to pass into the container 14 when the pressure in the pump body 12 is normalized, i.e. returned to at least ambient pressure. Accordingly, the valve assembly 16 is operative as a one way valve which enables mother's milk to be drawn from a breast of a user and accumulated in the container 14. The valve assembly 16 comprises a circular cap portion 36 which is adapted to be releasably retained in frictional engagement in the opening 31. The cap portion 36 has a plurality of openings 38 formed therein, and it includes a downwardly extending retaining lug 39 and a push-out pin 40 which projects upwardly from the center of the cap portion 36. The valve assembly 16 further comprises a circular elastomeric diaphragm element 42 which is received on the retaining lug 39 for releasably retaining it engagement with the underside of the disk 36 so that the diaphragm element 42 normally covers the openings 38. Accordingly, when a vacuum is applied to the interior of the pump body 12, the diaphragm 42 element is drawn against the underside of the cap 36 to sealingly obstruct the openings 38. However, when vacuum is released from the interior of the pump body 12 and the pressure therein is at atmospheric or greater, liquid, such as mother's milk, can pass downwardly through the openings 38 and between the diaphragm 42 and the underside of the cap 36 so that the liquid gravitates or is pushed into the container 14.

[0018] The piston and cylinder assembly 18 comprises a cylinder portion 44 having a closed front end wall 46. The cylinder portion 44 is open at the rear end thereof, and a reduced aperture or passage 48 extends between the interior of the cylinder portion 44 and the interior of the pump body 12. Also included in the piston and cylinder assembly 18 is a piston element 49 including a piston head 50, having a rearwardly extending piston stem 52 thereon, and a seal 54 on the piston head. The piston head 50 is dimensioned to be loosely received in the cylinder portion 44, and the seal 54 is received on the piston head 50 so that it normally maintains the piston head 50 in spaced, but sealed, relation to the inner wall of the cylinder portion 44. The seal 54 is of cup-shaped configuration, and it includes a sealing rim 56 which is adapted to sealing engage the inner wall of the cylinder 44 in a manner which permits the piston head 50 to travel back and forth in the interior of the

cylinder portion 44. In this regard, the piston head 50 is normally guided solely by the seal 54 as the piston head 50 travels in the cylinder portion 44. As a result, it is not normally possible for the piston rod to pivot on other guide means which might cause the piston head 50 to be urged against the wall along one side of the cylinder portion 44 and thereby cause the seal 54 to be partially separated from the opposite side of the wall of the cylinder portion 44. The piston stem 52 has a reduced aperture 57 therein adjacent the piston head 50 and the piston element 49 further comprises a thumb ring 58 which is received on the rear end of the piston stem 52. As illustrated, the components of the piston element 49, i.e. the piston head 50, the piston stem 52, and the thumb ring 58, and the cylinder portion 44 are dimensioned to permit the piston element 49 to be reciprocally moved between the first or forward position illustrated in Figs. 1 and 4 and the second or rearward position illustrated in Figs. 2 and 5. Accordingly, when the breast engaging portion 24 is received in engagement with a breast of a user and the piston head 50 is drawn rearwardly in the cylinder portion 44 from the first or forward position thereof to the second or rearward position thereof, a vacuum is applied to the interior of the cylinder portion 44 which is communicated to the interior of the pump body 12 through the passage 48 for extracting mother's milk from the user's breast.

[0019] The handle element 20 includes a base portion 60 which extends outwardly from the pump body 12 in a direction substantially opposite to that of the breast engaging portion 24. The handle element 20 further comprises a spring retainer portion which extends upwardly from the base portion 60 and a handle portion 62 which extends substantially perpendicularly upwardly from the base portion 60, the handle portion 62 having an inwardly facing spring clip 64 thereon. The handle portion 62 is formed in an elongated generally rounded configuration, and it is adapted to be comfortably received in a hand of a user so that the fingers on the hand are at least partially wrapped around the handle portion 62. As will be readily apparent, when the handle portion 62 is received in a hand of a user in this manner, the thumb on the same hand is readily receivable in the thumb ring 58 for drawing the piston head 50 rearwardly in the cylinder portion 44 with a simple and easy squeezing action. As will also be apparent, the construction and orientation of the piston element 49 enable the piston element 49 to be drawn rearwardly by a natural ergonomically favorable thumb movement in which the thumb ring 58 is drawn along a constrained path which keeps the piston element 49 generally aligned with the axis of movement thereof. The size and configuration of the seal 54 and the absence of other means for guiding the piston element 49 allows moderate deviations in the orientation of the piston element 49 without affecting the seal between the seal 54 and the wall of the cylinder 44

[0020] The spring element 22 is illustrated most clearly in Fig. 3, and it is operative for biasing the piston head 50 to the forward or first position thereof in the cylinder 44 as illustrated in Figs. 1 and 4. The spring element 22 has an elongated longitudinally extending guide slot 66 formed therein, and it has a rectangular aperture 68 formed therein adjacent one end thereof. The spring element 22 has an opening 70 formed therein at the opposite end thereof which defines a pair of inwardly extending retaining arms 72 having opposed terminal pins 74 thereon. The spring element 22 is assembled in the pump 10 so that the pins 74 are received in opposite ends of the aperture 57 in the piston stem 52, and so that the retaining projection 61 is received in the slot 66. The spring element 22 is further assembled so that the aperture 68 is received in the spring clip 64 to retain the spring element 22 in a partially bent position, wherein it extends between the handle portion 62 and the piston stem 52. As will be seen, the spring element 22 is dimensioned so that when it is in the first position thereof illustrated in Fig. 1, the spring element 22 is in a first partially bent disposition, and so that when the piston head 50 is drawn rearwardly to the position illustrated in Fig. 2, the spring element 22 is moved into a second further partially bent disposition. However, because of the overall length of the spring element 22 and the extent of the possible travel of the piston head 50 in the cylinder 44 the spring element 22 is not permitted to either reach a substantially straight disposition or a sharply bent disposition. As a result, the forward biasing force applied by the spring element 22 to the piston head 50 is substantially constant or uniform throughout the travel of the piston head 50 in the cylinder portion 44. Accordingly, the amount of force required to draw the piston head 50 rearwardly in the cylinder 44 does not normally increase significantly as the piston head 50 travels rearwardly in the cylinder portion 44, and it is relatively easy for an operator to draw the piston head 50 rearwardly against the force of the spring element 22. Nevertheless, the spring element 22 is capable of effectively returning the piston head 50 to a forward position in the cylinder portion 44.

[0021] Accordingly, for use in operation of the breast pump 10 the breast engaging element 24 is positioned in engagement with a breast of a user so that the nipple on the breast is directed into the tubular portion 26. The handle element 20 is then grasped with the fingers on a hand of the user, and a thumb on the same hand is passed through the thumb ring 58. The thumb ring 58 is then drawn toward the handle portion 62 by drawing the thumb on the operator's hand toward the fingers thereon. By operating the pump 10 in this manner it is possible to apply a sufficient level of vacuum to the interior of the pump body 12 to draw mother's milk from the operator's breast so that the milk passes into the tubular portion 26. Further, by thereafter releasing the piston head 50 so that it is returned to its initial forward position in the cylinder portion 44, the vacuum in the pump body 12 is released, the pressure in the pump body returns to atmospheric pressure or greater, and the extracted

milk passes through the valve assembly 16 and into the container 14. Still further, by then repeating this entire operation a plurality of times, it is possible to apply and release vacuum in the interior of the pump body 12 in a pulsating fashion which causes milk to be repeatedly extracted from the breast as vacuum is applied thereto and released and which allows the extracted milk to pass into the container 14 through the seal element 16. In this regard, at the same time, the vent hole 32 releases pressure from the interior of the container 14 when the pressure in the pump body 12 exceeds atmospheric pressure.

[0022] It is seen therefore that the instant invention provides an effective breast pump for extracting milk from a female breast. In this regard, the piston and cylinder assembly 18, the handle element 20 and spring element 22 are positioned so that an operator of the device 10 can effectively and easily repeatedly draw the piston head 50 rearwardly in the cylinder portion 44 for applying suction to the pump body portion 12.

[0023] Specifically, the piston and cylinder assembly 18, the handle element 20 and the spring element 22 are constructed and oriented so that the piston and cylinder assembly 18 can be easily operated by drawing the piston head 50 an outward direction relative to a breast of an operator. This enables the operator to comfortably operate the device 10 without requiring awkward manipulations, such as bending the wrist backwards or the application of excessive force to the piston head 50. Further, because the spring element 22 applies a substantially uniform or constant biasing force to the piston element 49 throughout the travel thereof, and because the device 10 is operative without pivoting levers and the like, an operator of the device 10 can more effectively operate the piston and cylinder assembly 18 so as to repeatedly reciprocate the piston head 50 in the cylinder portion 44 over an extended period of time. Still further, because the piston head 50 is guided in its movement in the cylinder portion 44 solely by the rim portion 56 of the seal 54, the seal 54 is normally maintained in uniform pressurized engagement with the inner wall of the cylinder portion 44 around the entire circumference of the rim portion 56, and it cannot normally be moved away from the inner wall as a result of the engagement of the piston stem 52 with other guide means. Hence it is seen, that the breast pump of the instant invention represents a significant improvement in the related art which has substantial commercial merit.

Claims

1. A breast pump comprising:

   a. a pump body (12) having an interior and including a breast engaging portion (24) facing in a first direction and a base portion (28) ;
   b. a breast milk receiving container (14) on said base portion (28);
   c. a one way valve (16) between said base portion (28) and said container (14) for alternatively maintaining a vacuum in said pump body (12) or allowing breast milk to pass into said container (14);
   d. a piston and cylinder assembly (18) on said pump body (12), said piston and cylinder assembly (18) including a cylinder (44) communicating with the interior of said pump body (12), a piston (49) in said cylinder (44) and sealing means (54) between said piston (49) and said cylinder (44), said piston (49) being moveable in said cylinder (44) in a second direction which is substantially opposite to said first direction for applying vacuum to the interior of said pump body (12), said piston and cylinder assembly (18) including a thumb receiving element (58) which is directly connected to said piston (49), said thumb receiving element (58) being moveable in said second direction for directly moving said piston (49) in said second direction in said cylinder (44); and
   e. a handle (62) on said pump body (12) adapted to receive a hand of a user, the thumb on said hand being received in said thumb receiving element (58) whereby the piston (49) is movable in the second direction by said thumb.

2. The breast pump of claim 1 wherein said handle (62) being spaced from said thumb receiving element (58) in said second direction.

3. The breast pump of claim 1 and further comprising biasing means (22) biasing said piston (49) in substantially said first direction in said cylinder (44).

4. The breast pump of claim 3 in which said piston (49) travels in said second direction from a first position in said cylinder (44) to a second position therein for applying vacuum to said pump body interior, said biasing means (22) biasing said piston (49) with a substantially constant biasing force during movement of said piston (49) between said first and second positions.

5. The breast pump of claim 4, said biasing means comprising a resiliently bendable elongated band (22), said band (22) moving from a first reduced partially bent position thereof to a second increased partially bent position thereof during movement of said piston (49) from the first position thereof to the second position thereof.

6. The breast pump of claim 4, said handle (62) being spaced from said thumb receiving element (58) when said piston is in the first position thereof.

7. The breast pump of claim 1, said piston (49) being spaced from said cylinder (44) and being guided in its travel therein in said second direction solely by said sealing means (54) and said thumb in said thumb receiving element (58).

Patentansprüche

1. Brustpumpe, umfassend:

   a. einen Pumpenkörper (12) mit einem Innenraum, der einen in eine erste Richtung gerichteten Brust-Anlegeabschnitt (24) und einen Basisabschnitt (28) aufweist;

   b. einen Brustmilch-Aufnahmebehälter (14) auf dem Basisabschnitt (28);

   c. ein Einwegventil (16) zwischen dem Basisabschnitt (28) und dem Behälter (14), um alternativ ein Vakuum im Pumpenkörper (12) zu halten oder es zuzulassen, dass Brustmilch in den Behälter (14) gelangt;

   d. eine Kolben- und Zylinderanordnung (18) auf dem Pumpenkörper (12), wobei die Kolben- und Zylinderanordnung (18) einen Zylinder (44), der mit dem Innenraum des Pumpenkörpers (12) kommuniziert, einen Kolben (49) im Zylinder (44) und Dichtungsmittel (54) zwischen dem Kolben (49) und dem Zylinder (44) umfasst, wobei der Kolben (49) im Zylinder (44) in eine zweite Richtung bewegt werden kann, die der ersten Richtung entgegengesetzt ist, um Vakuum an den Innenraum des Pumpenkörpers (12) anzulegen, wobei die Kolben- und Zylinderanordnung (18) ein Daumenaufnahmeelement (58) umfasst, das direkt mit dem Kolben (49) verbunden ist, wobei das Daumenaufnahmeelement (58) in die zweite Richtung bewegt werden kann, um den Kolben (49) im Zylinder (44) in die zweite Richtung zu bewegen; und

   e. einen Griff (62) auf dem Pumpenkörper (12), der dazu ausgebildet ist, eine Hand einer Benutzerin aufzunehmen, wobei der Daumen dieser Hand im Daumenaufnahmeelement (58) aufgenommen wird, wodurch der Kolben (49) durch den Daumen in die zweite Richtung bewegt werden kann.

2. Brustpumpe nach Anspruch 1, worin der Griff (62) vom Daumenaufnahmeelement (58) in der zweiten Richtung beabstandet ist.

3. Brustpumpe nach Anspruch 1, die weiters Vorspannmittel (22) umfasst, die den Kolben (48) im Wesentlichen in die erste Richtung im Zylinder (44) vorspannen.

4. Brustpumpe nach Anspruch 3, bei der der Kolben (49) in der zweiten Richtung von einer ersten Position im Zylinder (44) in eine zweite Position darin wandert, um an den Innenraum des Pumpenkörpers ein Vakuum anzulegen, wobei das Vorspannmittel (22) den Kolben (49) während der Bewegung des Kolbens (49) zwischen der ersten und der zweiten Position mit einer im Wesentlichen konstanten Vorspannkraft vorspannt.

5. Brustpumpe nach Anspruch 4, wobei das Vorspannmittel ein elastisch biegbares längliches Band (22) umfasst, wobei sich das Band (22) während der Bewegung des Kolbens (49) aus seiner ersten Position in seine zweite Position aus einer ersten weniger teilweise gebogenen Position in eine zweite stärker teilweise gebogene Position bewegt.

6. Brustpumpe nach Anspruch 4, wobei der Griff (62) vom Daumenaufnahmeelement (58) beabstandet ist, wenn sich der Kolben in seiner ersten Position befindet.

7. Brustpumpe nach Anspruch 1, wobei der Kolben (49) vom Zylinder (44) beabstandet ist und in seinem Weg darin in der zweiten Richtung allein durch die Dichtungsmittel (54) und den Daumen im Daumenaufnahmeelement (58) geführt wird.

Revendications

1. Tire-lait comprenant :

   a. un corps de pompe (12) présentant un intérieur et comportant une portion (24) venant en prise avec le sein orientée dans une première direction et une portion de base (28) ;

   b. un récipient (14) recevant le lait sur ladite portion de base (28) ;

   c. une soupape à une voie (16) entre ladite portion de base (28) et ledit récipient (14) pour conserver alternativement un vide dans ledit corps de pompe (12) ou pour permettre au lait de passer dans ledit récipient (14) ;

   d. un ensemble à piston et à vérin (18) sur ledit corps de pompe (12), ledit ensemble à piston et à vérin (18) comportant un vérin (44) communiquant avec l'intérieur dudit corps de pompe (12), un piston (49) dans ledit vérin (44) et un moyen d'étanchéité (54) entre ledit piston

(49) et ledit vérin (44), ledit piston (49) étant déplaçable dans ledit vérin (44) dans une seconde direction qui est sensiblement opposée à ladite première direction pour appliquer un vide à l'intérieur dudit corps de pompe (12), ledit ensemble à piston et à vérin (18) comportant un élément de réception de pouce (58) qui est directement relié audit piston (49), ledit élément de réception de pouce (58) étant déplaçable dans ladite seconde direction pour déplacer directement ledit piston (49) dans ladite seconde direction dans ledit vérin (44) ; et

e. une poignée (62) sur ledit corps de pompe (12) apte à recevoir une main d'une utilisatrice, le pouce sur ladite main étant reçu dans ledit élément de réception de pouce (58) par quoi le piston (49) est déplaçable dans la seconde direction par ledit pouce.

2. Tire-lait selon la revendication 1, où ladite poignée (62) est espacée dudit élément de réception de pouce (58) dans ladite seconde direction.

3. Tire-lait selon la revendication 1 et comprenant en outre un moyen de sollicitation (22) sollicitant ledit piston (49) sensiblement dans ladite première direction dans ledit vérin (44).

4. Tire-lait selon la revendication 3, où ledit piston (49) se déplace dans ladite seconde direction à partir d'une première position dans ledit vérin (44) à une seconde position dans celui-ci pour appliquer un vide audit intérieur du corps de pompe, ledit moyen de sollicitation (22) sollicitant ledit piston (49) avec une force de sollicitation sensiblement constante pendant le déplacement dudit piston (49) entre lesdites première et seconde positions.

5. Tire-lait selon la revendication 4, où ledit moyen de sollicitation comprend une bande oblongue (22) pouvant être recourbée élastiquement, ladite bande (22) se déplaçant d'une première position réduite, partiellement courbée de celle-ci à une seconde position plus grande, partiellement courbée de celle-ci pendant le déplacement dudit piston (49) de sa première position à sa seconde position.

6. Tire-lait selon la revendication 4, où ladite poignée (62) est espacée dudit élément de réception de pouce (58) lorsque ledit piston se trouve dans sa première position.

7. Tire-lait selon la revendication 1, où ledit piston (49) est espacée dudit vérin (44) et est guidé dans son déplacement dans celui-ci dans ladite seconde direction uniquement par ledit moyen d'étanchéité (54) et ledit pouce dans ledit élément de réception de pouce (58).

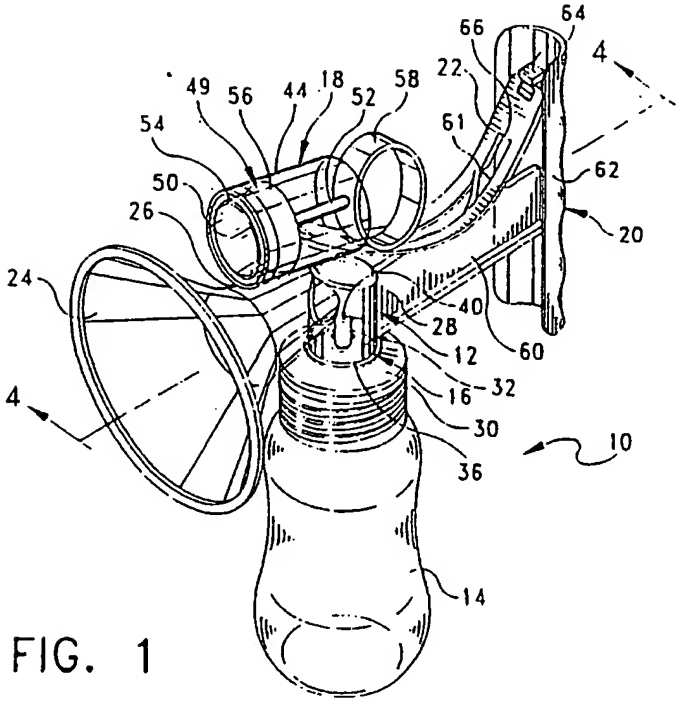
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FIG. 1

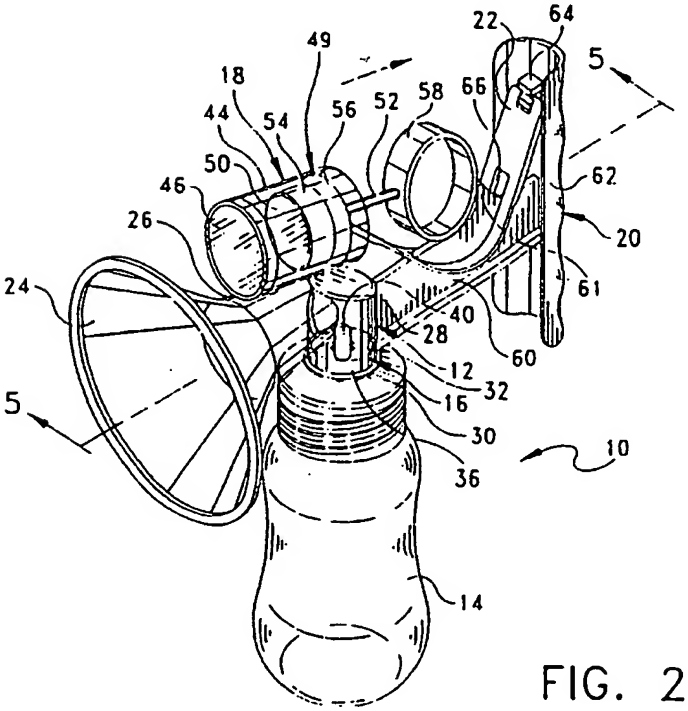
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FIG. 2

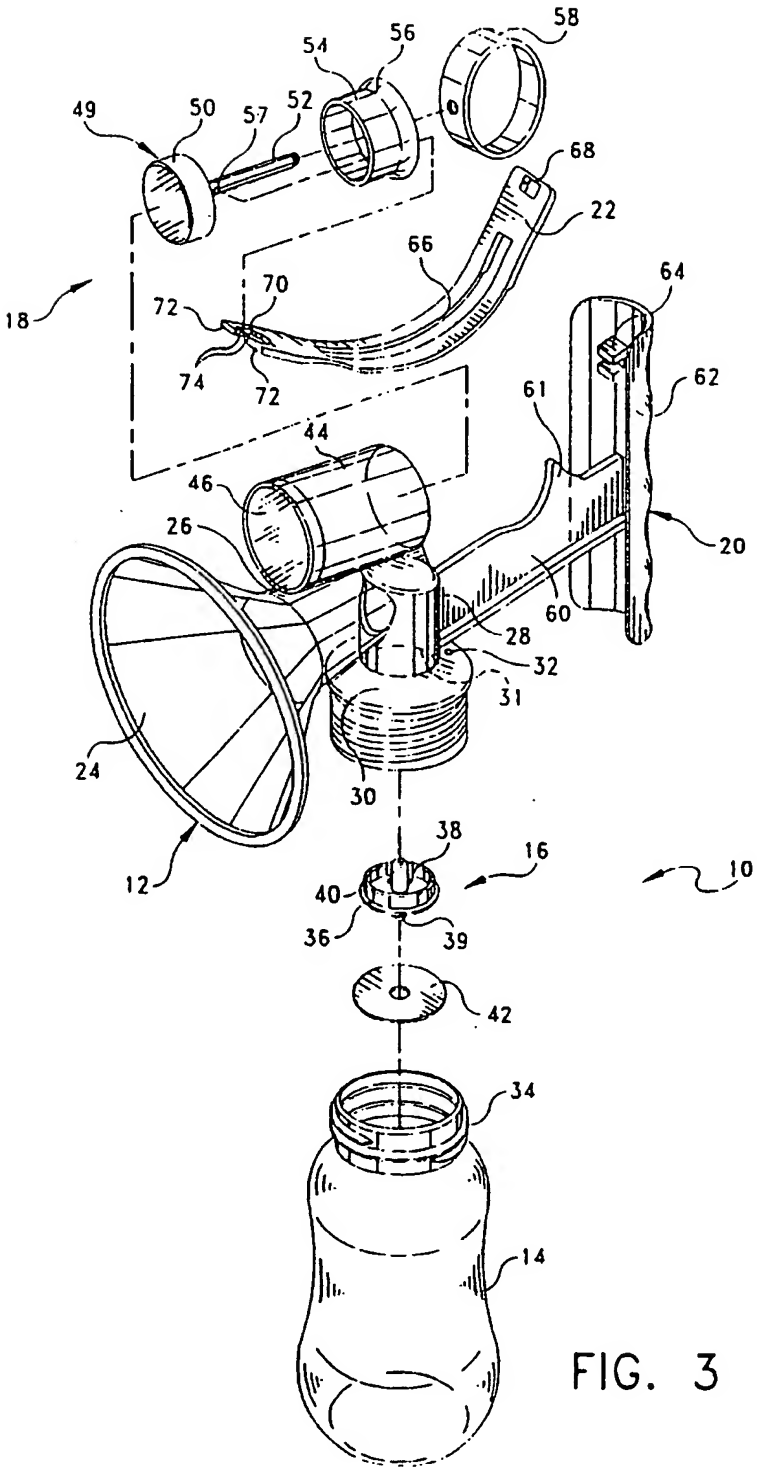
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FIG. 3

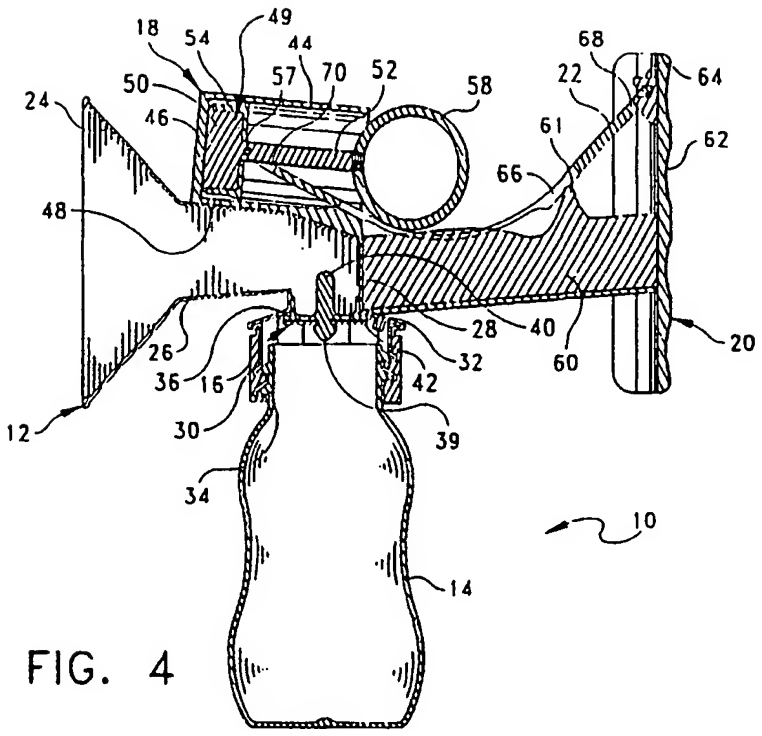
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FIG. 4

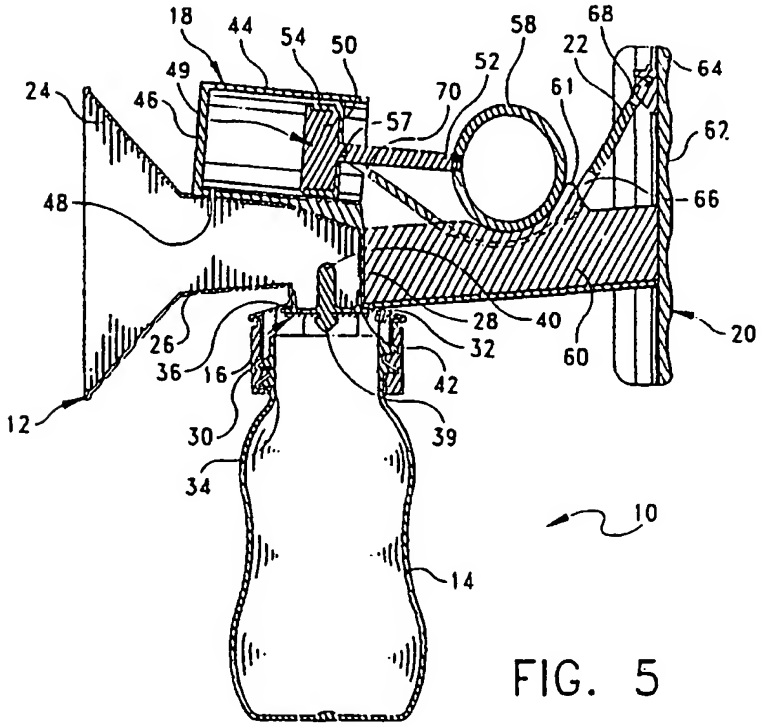
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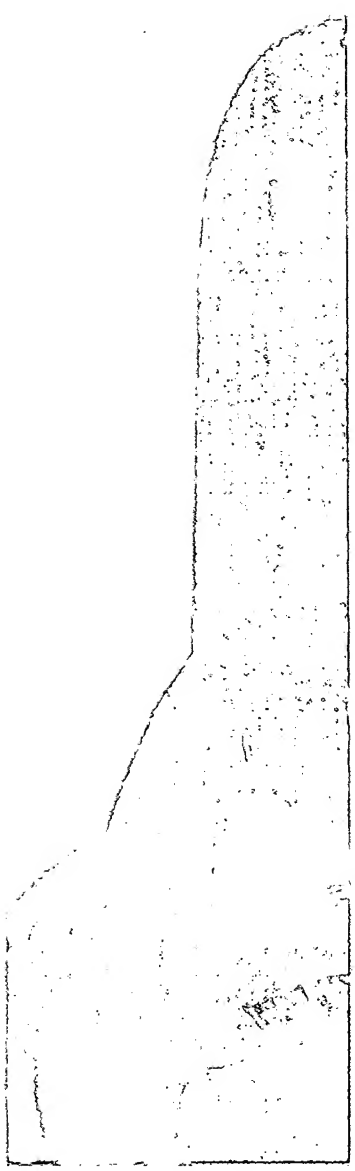
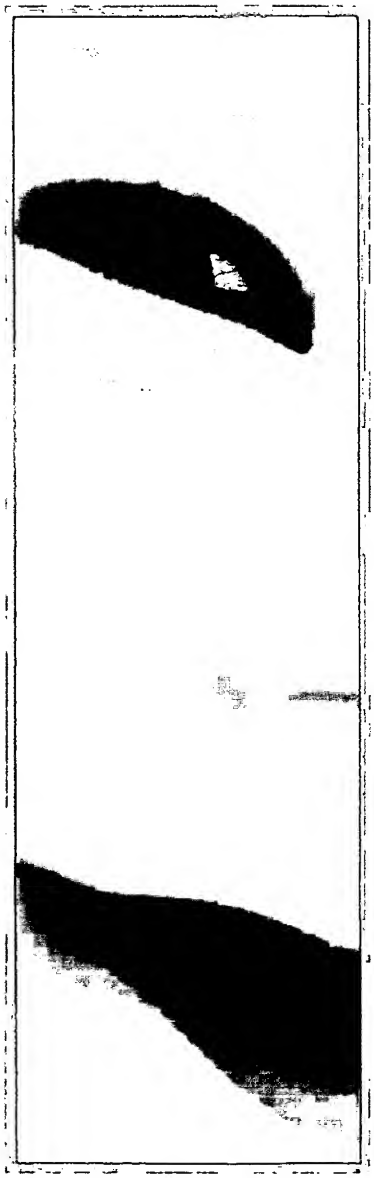
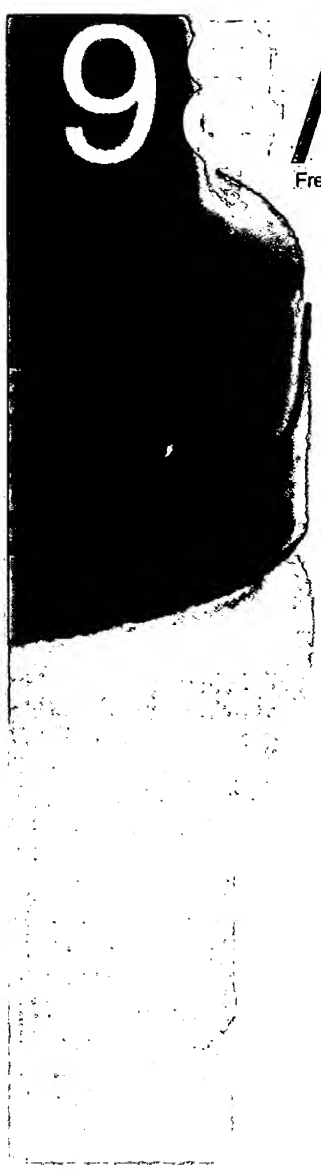
FIG. 5

Tommee Tippee®







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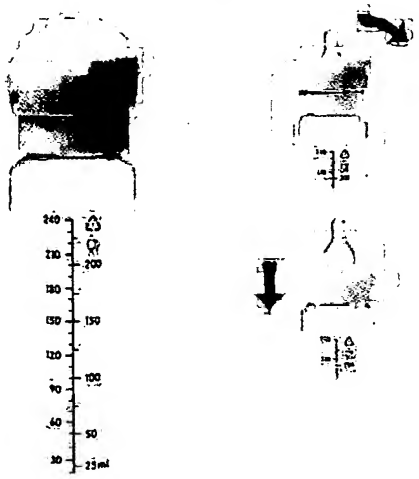
French/ Dutch/ German/ Russian

Travel Bottle (250ml) 437092

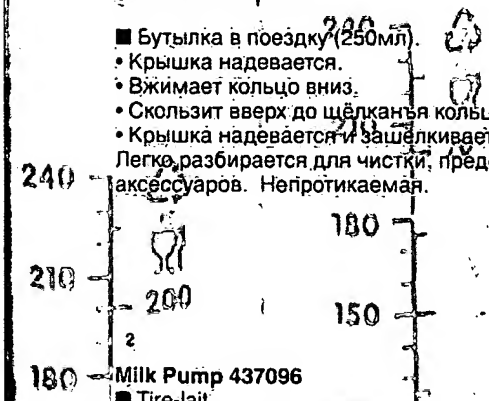
■ Biberon de voyage.
• Capuchon anti-fuite à charnière.
• Basculer le capuchon.
• Faire glisser la bague en position basse.
• Remonter et verrouiller la bague en position haute.
• Refermer le capuchon.
Facile à démonter pour le nettoyage. Évite la perte des accessoires.



■ Reisfles.
• Lekvrije fliptuit.
• Trek het deksel naar achteren.
• Duw de ring naar beneden.
• Schuif naar boven tot ring vastklikt.
• Duw het deksel opnieuw op zijn plaats tot het vastklikt.
Eenvoudig uit elkaar te nemen om te reinigen. U verliest niet langer onmisbare onderdelen.

■ Auslaufsicherer Klappverschluß
• Verschluß hochklappen.
• Ring herunterdrücken.
• Bis zum Klick hochschieben.
• Deckel zudrücken und einschnappen lassen.
Zum Reinigen leicht auseinanderzunehmen. Zubehörteile gehen nicht verloren.

■ Бутылка в поездку (250мл).
• Крышка надевается.
• Вжимает кольцо вниз.
• Скользит вверх до щёлканья кольца.
• Крышка надевается и защёлкивается.
Легко разбирается для чистки, предотвращает потерю аксессуаров. Непротикаемая.



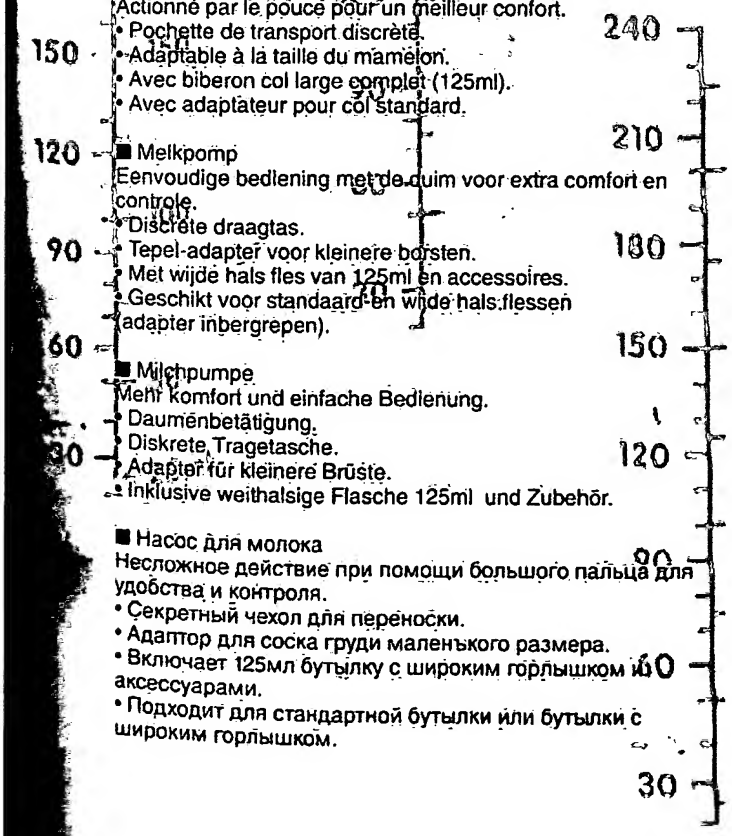
Milk Pump 437096

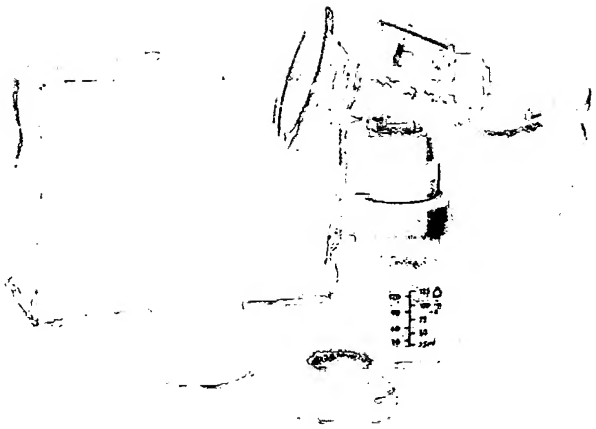
■ Tire-lait.
Actionné par le pouce pour un meilleur confort.
• Pochette de transport discrète.
• Adaptable à la taille du mamelon.
• Avec biberon col large complet (125ml).
• Avec adaptateur pour col standard.

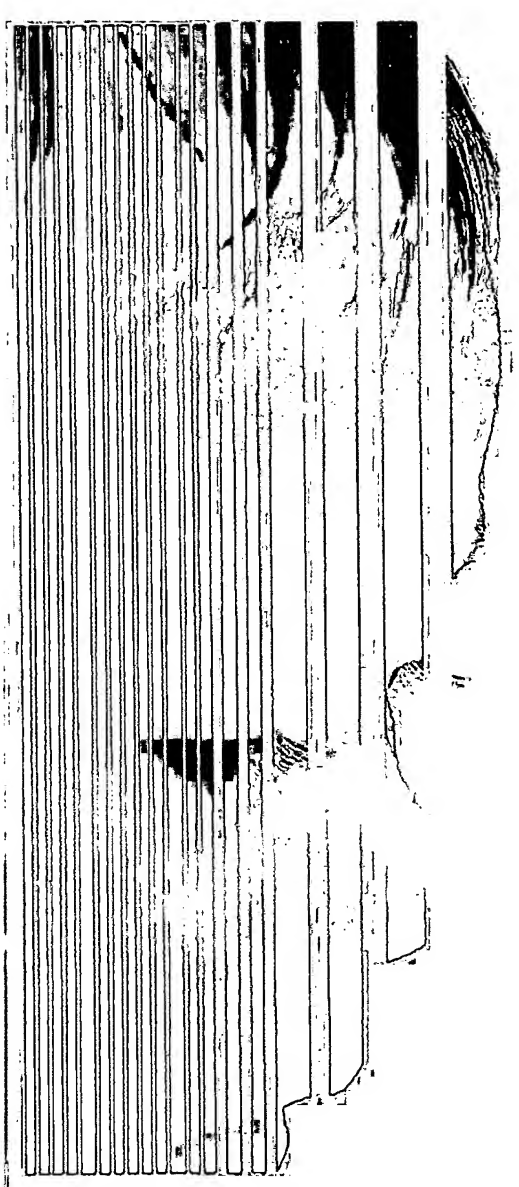
■ Melkpomp
Eenvoudige bediening met de duim voor extra comfort en controle.
• Discrete draagtas.
• Tepel-adapter voor kleinere borsten.
• Met wijde hals fles van 125ml en accessoires.
• Geschikt voor standaard en wijde hals flessen (adapter inbegrepen).

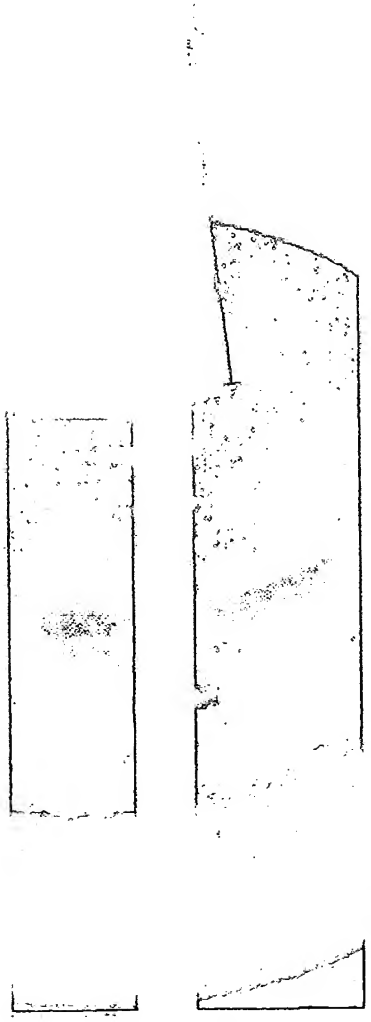
■ Milchpumpe
Mehr komfort und einfache Bedienung.
• Daumenbetätigung.
• Diskrete Tragetasche.
• Adapter für kleinere Brüste.
• Inklusive weithalsige Flasche 125ml und Zubehör.

■ Насос для молока
Несложное действие при помощи большого пальца для удобства и контроля.
• Секретный чехол для переноски.
• Адаптор для соска груди маленького размера.
• Включает 125мл бутылку с широким горлышком и аксессуарами.
• Подходит для стандартной бутылки или бутылки с широким горлышком.









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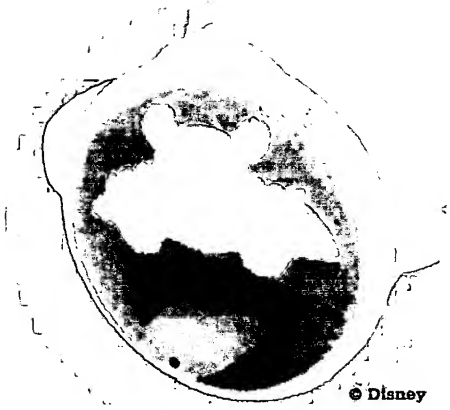
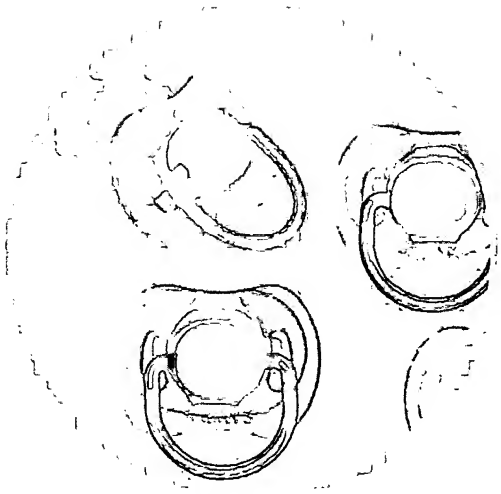
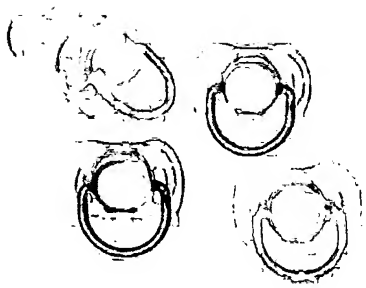




Tommee Tippee

ADVANCED BABY CARE
MAWS
pure simplicity



newborn soother 85685410
• Vented orthodontic teat. • Ideal from Birth.

85685410
• Tétine orthodontique. • S'utilise à partir de la naissance.

85685410
• Kieferorthopädischer Sauger. • Der VARIFLO-Sauger ist so geschaffen, dass er von Geburt an ideal für Ihren Säugling ist.

85685410
• Orthodontische speen met luchtgaatjes. • Ideaal vanaf geboorte.

85685410
• Ortodontisk napp med lufthål. • Idealisk från födseln.

85685410
• Tandrigtig sut. • Perfekt lige fra fødslen.

85685410
• Ilmarejällinen ortodontinen. • Sopii syntymästä lähtien.

85685410
• La tetina de ortodoncia. • Ideal desde el nacimiento.

85685410
• Tetina ortodontica ventilada. • Ideal a partir da nascença.

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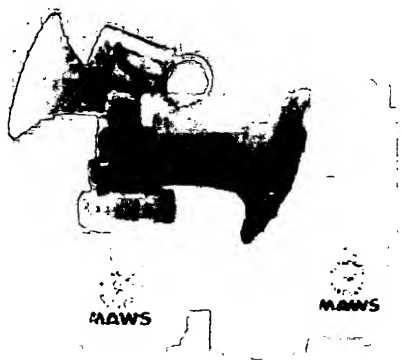
• La tettarella ortodontica ventilata. • Ideale dalla nascita.



decorated soother 85685610
• Vented orthodontic teat.

85685610
• Une tétine orthodontique.

85685610
• Kieferorthopädischer Sauger.

85685610
• Orthodontische speen met luchtgaatjes.

85685610
• Ortodontisk napp med lufthål.

85685610
• Tandrigtig sut med ventil.

85685610
• Ilmarejällinen ortodontinen.

85685610
• La tetina de ortodoncia con abertura.

85685610
• Tetina ortodontica ventilada.

85685610
• Tettarella ortodontica ventilata.

breast feeding starter kit 85675053
• Everything you need to feed your baby. • Breast Pump with easy one handed action.

premier kit d'allaitement 85675053
• Le nécessaire pour allaiter votre bébé. • Un tire-lait qui s'utilise d'une seule main.

milchpumpen-komplett-set 85675053
• Alles was Mutter und Baby zum Stillen brauchen. • Milchpumpe mit einfacher Ein-Hand-Bedienung.

borstvoedingsset 85675053
• Handige, met één hand te bedienen borstpomp.

amningsgrundsats 85675053
• Bröstpump med lätt enhandsfunktion.

ammestartsæt 85675053
• Brystpumpen er let at betjene med én hånd.

rintapumppu 85675053
• Rintapumppu, jossa yhden käden käyttö.

kit extractor de leche 85675053
• Todo lo que necesita para ayudarle a amamantar a su bebé. • Extractor de leche de fácil accionamiento con una sola mano.

bomba para tirar o leite do seio 85675053
• Bomba para tirar o leite do seio, accionado facilmente com uma mão.

kit iniziale per l'allattamento al seno 85675053
• Tutto il necessario per assistervi ad allattare il bambino al seno. • Tiralatte facilmente azionato con una mano.

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Tommee Tippee

MAWS
pure simplicity

MAWS BREAST PUMP

DESIGN BRIEF

Background

We have no market data for the breast pump market, but trade buyers tell us that the launch of the Avent Isis Pump last year has had a dramatic effect. Isis is dominating the premium priced end of the market, with own brand pumps such as Boots and Mothercare providing an acceptable low price alternative. In the past the Maws pump could compete effectively with the old Avent product on performance, price, and aesthetics. Now we run the risk of losing both sales and listings as the Isis pump is perceived to be the state of the art product, while we cannot compete on price with the own brands.

It has been suggested that Isis is not as good as it is claimed, and that our design has other benefits, such as the thumb action. We are going to increase the promotion of our pump in the coming months through PR and work with the health professionals to help get the message across. I am also planning to run a consumer trial of our pump vs Avent, as soon as we have the amended mouldings available.

However, if we are to compete more effectively with Avent long term, I believe that we need a fundamental review of the aesthetics and performance of the pump.

Requirements of the new Maws Pump

➢ The pump must reflect the Maws brand positioning: Advanced Baby Care - pure simplicity.

- ✓ technically advanced and innovative
- ✓ modern
- ✓ caring
- ✓ premium

➢ To a consumer, all breast pumps must look like frightening contraptions. The simpler and less aggressive they look, and the easier they are to use, the better.
➢ Our main point of difference vs Avent is the thumb action. If this is a better system than Avent we should keep it, but it must work.

Suggestions as to how these aims could be achieved:

➢ The Maws and Avent pumps have the same number of components (10), some of which are tiny, easy to lose, and difficult to assemble. It would be a great benefit to the consumer if this number could be reduced.
➢ The components of the Avent pump are mainly clear polycarbonate and silicone, which looks clean, and disguises the number of components. Are there alternative materials which we could use to achieve the same effect? e.g. make the nipple cushion and the seal clear instead of white.
➢ Aim to streamline the design of the horn and body of the pump. With the Avent pump most of the moving parts are hidden away.

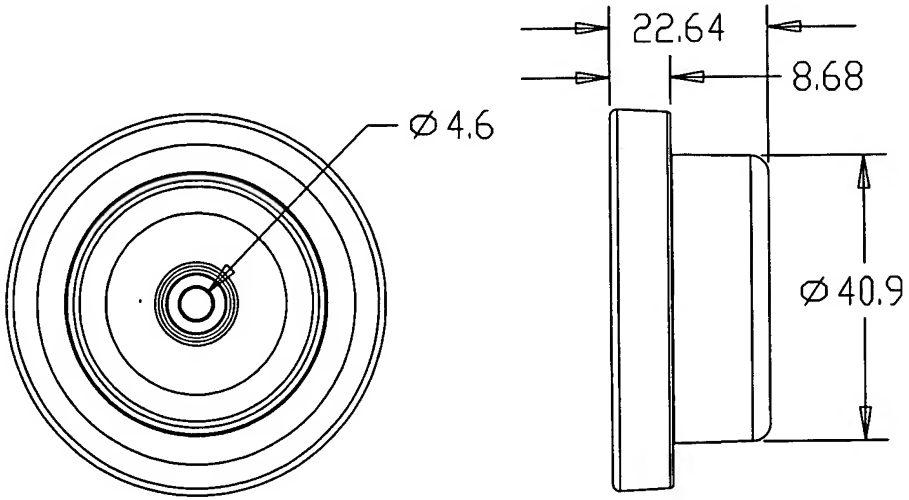
➢ Consider the pump aesthetically as part of the core Maws feeding range, rather than as a separate a medical instrument, possibly using elements of the design of other products in the range to create a consistent look e.g. the curved shape of the bottles.
➢ Design it primarily to take wide neck bottles with an adapter for standard neck (rather than the other way round). This would mean that we could do away with one component for the UK range.

These are only suggestions, all other ideas will be welcome.

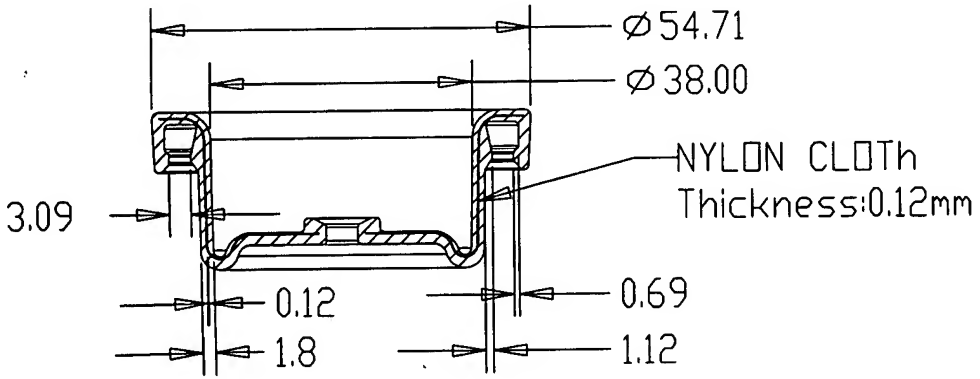
The planned timetable for the new pump is to launch in September 1999.

Deadline for initial concepts: 5 October

Elizabeth Walden
11/09/98



SCALE 0.500



SECTION A-A

1. Parts to be of good appearance, free of flash, sink, weld lines etc.
2. Material: SILICONE
3. Texture: Visible: Polish Hidden: Polish
4. Nominal wall thickness (mm): 1.8
5. Volume (cubic mm): 10600
6. Radii:sharp edges are assumed to be R0.5 except as specified
7. Draft:unless otherwise specified: 0.5°
8. Tolerances:Unless otherwise specified: 0.00 ±0.1; 0.0 ±0.2; angles: ±0.5°

REV	REV	DCN#	DATE	BY	CHK
D1	-	---	26-Dec-05	TON	FAL

PREPARE DRAWING FOR APPROVE TO TOOLING ISSUE

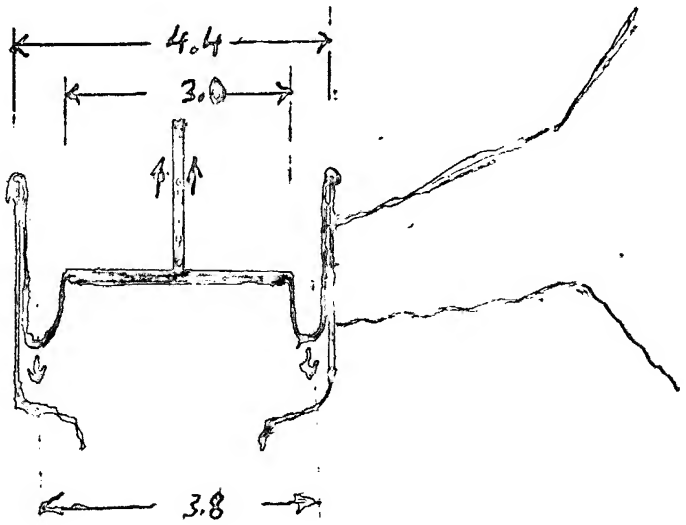
PRODUCT MARKETING MAYBOR LTD.
14/F., China Aerospace Centre, 143 Hoi Bun Road, Kwun Tong, Kln., Hong Kong
Tel: (852)2793 6703 Fax: (852)2344 1840

USE LATEST ISSUE OF DRAWING ONLY:
DESTROY PREVIOUS ISSUES

PART NAME	DIAPHRAGM
DRAWING NO.	PMM0115-02
CUSTOMER NO. ---	PAPER SIZE A4
DESIGNER ---	DATE 26-Dec-05
CHECKER ---	DATE 26-Dec-05

SCALE	UNIT	SHEET
1.000	MM	1 of 1

5/5/07
I LANSARSON



~ 1:1
- all in cm
(approx)

annular
area 'A'
exposed to downward
stretching:

$-(2.2^2 - 1.5^2)\pi \approx 8.2\ cm^2$

- max suction ~ 400 mb
av. " ~ 200 "
- amount of stretch ~ 0.4 cm

∴ total work (energy wasted on
stretching silicon):

$8.2\ cm^2 \times 0.2\ kg/cm^2 \times 0.4\ l \approx .65\ kg\ cm$ (a)

work done: - stroke: ~ 1.6
- effective area loading actuator
$\sim 1.9^2\pi = 11\ cm^2$
- av suction pull: 0.2 kg

total work: $1.9^2\pi \times 0.2 \times 1.6 \sim 3.6\ kg\ cm$ (b)

wasted E: (a)/(b) = 18%